CLAIMS

What is claimed:

1. A method, comprising:

forming a first layer over a substrate, the first layer sensitive to a first chemistry;

forming a second layer on the first layer, the second layer formed to a first thickness and the second layer not sensitive to the first chemistry;

forming a third layer over the second layer, the third layer removable by the first chemistry;

patterning the third layer to have an opening;

etching a substantial thickness of the second layer through the opening, leaving a thin, unetched portion of the second layer on the first layer, the thin unetched portion having a second thickness;

removing the third layer using the first chemistry, the thin, unetched portion of the second layer protecting the first layer from the first chemistry; and

removing the thin, unetched portion of the second layer using a second chemistry to which the first layer is not sensitive.

2. The method of claim 1, wherein the second thickness is approximately 10% to 25% of the first thickness.

3. The method of claim 1, wherein the first layer is a germanium material, the second layer is a nitride, and the third layer is a photoresist material.

4. The method of claim 1, wherein the first layer is any one of germanium, gallium arsenide, aluminum nitride, or indium intiminide.

5. The method of claim 1, wherein removing a substantial portion of the second layer includes performing a timed dry etch to the second layer through the opening, the timed etch timed to remove approximately 75% - 90% of the second layer.

6. The method of claim 1, further comprising:

conditioning a surface of the first layer with a third chemistry, the conditioning causing the surface of the first layer to have primarily the same atomic termini.

7. A method, comprising:

forming a germanium layer on a semiconductor substrate;

forming a nitride layer on the germanium layer;

forming an oxide on the nitride layer;

forming a photoresist layer on the oxide layer;

patterning the photoresist layer to have an opening;

performing a first etch to the oxide layer through the opening with a first chemistry;

performing a second etch to the nitride layer through the opening with a second chemistry, the second etch being a timed dry etch that etches through about 75% to about 90% of the nitride layer with a second chemistry, to produce a protective nitride buffer over the germanium layer, the protective nitride buffer being about 10% to about 25% of

an original thickness of the nitride layer;

removing the photoresist layer with a third chemistry, the protective nitride buffer protecting the underlying germanium layer from the third chemistry;

performing a third etch to the protective nitride buffer, the third etch being a timed etch that etches through the approximate 10% to 25% of the nitride layer that was not previously etched in the second etch; and

wet cleaning a surface of the germanium layer with a fourth chemistry that cleans the surface and conditions the atomic termini of the surface to be primarily either hydrophobic or hydrophilic.

8. The method of claim 7, wherein the first chemistry is $CO/C_4F_8/O_2/Ar$, the second chemistry is $CH_2F_2/O_2/Ar$, the third chemistry includes an O_2 plasma and a sulfuric acid mixture with an oxidizing agent.

9. The method of claim 7, wherein the fourth chemistry is any one of vapor hydrofluorine (HF), vapor hydrochlorine (HCl), aqueous ultra-dilute HF, 1-29% ammonium hydroxide aqueous solution, or 0.1-2% hydrofluoric acid.

10. The method of claim 7, wherein wet cleaning of the germanium surface is performed at room temperature in dilute 0.1 – 10% by volume concentrations for a brief period of time 0.5 – 10 minutes.

11. The method of claim 7, wherein the third etch removes a portion of the oxide layer

as the protective nitride buffer is being etched, hence the method also including forming the oxide layer thicker than necessary to compensate for removed portion.

12. An apparatus, comprising:

a germanium layer on a substrate, the germanium layer having a surface with primarily the same atomic termini.

13. The apparatus of claim 12, wherein the surface has a primarily hydrophobic Ge-H atomic termination.

14. The apparatus of claim 13, further comprising a conductive material overlying the surface.

15. The apparatus of claim 12, wherein the surface has a primarily hydrophilic Ge-OH atomic termination.

16. The apparatus of claim 15, further comprising a dielectric material overlying the surface.

17. The apparatus of claim 12, further comprising:

a nitride layer overlying the germanium layer; and

an oxide layer overlying the germanium layer.